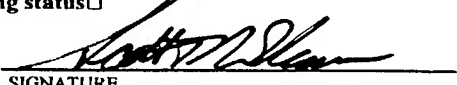


60 Rec'd PCT/PTO 31 AUG 2001

FORM PTO-1390 (REV 10-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				01151	
				U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <b>09/926097</b>	
INTERNATIONAL APPLICATION NO. PCT/N000/00062		INTERNATIONAL FILING DATE February 21, 2000		PRIORITY DATE CLAIMED March 1, 1999	
TITLE OF INVENTION PROCESS TANK AND METHOD FOR NON-VIGOROUS PROCESSING OF ORGANIC MATERIAL					
APPLICANT(S) FOR DO/EO/US Mikal MIKALSEN					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371. 3. <input type="checkbox"/> This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)). 4. <input type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (PCT Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) published w/ International Search Report a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> has been communicated by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). <b>Items 11 to 16 below concern document(s) or information included:</b> 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input type="checkbox"/> A <b>FIRST</b> preliminary amendment. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input type="checkbox"/> Other items or information:					

09926097, 120602

518 Rec'd PCT/PTO 3 1 AUG 2001

<b>09926097</b> INTERNATIONAL APPLICATION NO. PCT/NO00/00062		ATTORNEY'S DOCKET NUMBER 01151	
21 <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO <input type="checkbox"/> \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO <input type="checkbox"/> \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO <input type="checkbox"/> \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) <input type="checkbox"/> \$690.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) <input type="checkbox"/> \$100.00 <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>		<b>CALCULATIONS PTO USE ONLY</b>	
		\$ 860.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)) <input type="checkbox"/>		\$ 130.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	20 - 20 =	-	x \$18.00
Independent claims	2 - 3 =	-	x \$80.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		+ \$270.00	
<b>TOTAL OF ABOVE CALCULATIONS =</b>		\$ 990.00	
<input type="checkbox"/> Applicant claims small entity status <input type="checkbox"/> See 37 CFR 1.47 <input type="checkbox"/> The fees indicated above are reduced by 1/2 <input type="checkbox"/>		\$	
<b>SUBTOTAL =</b>		\$	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)) <input type="checkbox"/>		\$	
<b>TOTAL NATIONAL FEE =</b>		\$ 990.00	
Fee for recording the enclosed assignment (37 CFR 1.41(h)) <input type="checkbox"/> The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.028, 3.031) <input type="checkbox"/> \$40.00 per property +		\$	
<b>TOTAL FEES ENCLOSED =</b>		\$ 990.00	
		Amount to be refunded:	\$
		charged:	\$
a <input type="checkbox"/> A check in the amount of \$ _____ to cover the above fees is enclosed <input type="checkbox"/> b <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees <input type="checkbox"/> A duplicate copy of this sheet is enclosed <input type="checkbox"/> c <input type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____ <input type="checkbox"/> A duplicate copy of this sheet is enclosed <input type="checkbox"/> d <input checked="" type="checkbox"/> Fees are to be charged to a credit card <input type="checkbox"/> <b>WARNING:</b> Information on this form may become public <input type="checkbox"/> Credit card information should not be included on this form <input type="checkbox"/> Provide credit card information and authorization on PTO-2038 <input type="checkbox"/>			
<b>NOTE:</b> Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.437 (a) or (b)) must be filed and granted to restore the application to pending status <input type="checkbox"/>			
SEND ALL CORRESPONDENCE TO: Dennison, Scheiner, Schultz & Wakeman 612 Crystal Square 4 1745 Jefferson Davis Highway Arlington, VA 22202-3417 (703) 412-1155 Ext. 17 (703) 412-1161 FAX			
		 SIGNATURE Scott T. Wakeman NAME 37,750 REGISTRATION NUMBER	

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PROCESS TANK AND METHOD FOR NON-VIGOROUS PROCESSING OF ORGANIC MATERIAL

The present invention relates to a process tank for gentle treatment of organic material, especially intended for treatment of organic material like fish waste, crab, krill or plant materials. The invention also relates to a method for processing organic material.

**Background**

In a process environment such as the fish processing industry there is a need to treat the raw material in an effective yet gentle way so that a highest possible yield, but still a very clean product, is achieved.

With the use of an ordinary stirring assembly, e.g. consisting of an anchor stirrer or the like, a part of the material which should be recovered will be crushed and will be lost with the process water. Furthermore, the extraction fluid will be contaminated with particles from the residue. Another disadvantage is that a part of the extraction fluid is held back with the residue, giving a loss compared to the theoretical yield.

There are many practical applications of such process tanks, for instance the removal of waste from the fish processing industry, processing of krill on board a trawler etc. An example from another area is the extraction of etheric oils from plant materials.

**Objective**

It is thus an objective with the present invention to provide a new and improved process tank which eliminates or significantly reduces the disadvantages mentioned above, and which facilitates an effective and yet gentle treatment of organic material, in which a higher yield of extracted material than previously obtainable can be achieved, without jeopardizing the quality of the product.

It is a further objective to provide a process tank which, to a high degree, is adapted for an industrial operation, where modification may be made to allow for automatic controlling etc, so that the overall economy of the processes is high.

### The invention

These and other objectives are achieved with a process tank for gentle treatment of its contents, especially intended for treatment of organic material, including means for agitation and characterized in that the process tank is a double tank comprising an inner  
5 tank with perforated wall areas which are rotatably supported with bearings in an outer tank with a substantially vertical axis of rotation, the perforated areas of the inner tank being provided with gratings and shovels being arranged slantingly in the space between the inner and the outer tank, said shovels, during rotation of the inner tank contribute to the agitation of the fluid in the tank, and a lid arranged to be raised and lowered on top  
10 of the inner tank, said lid preferably is provided with gratings.

The invention also concerns a method for processing organic material such as fish waste, crab shells, krill or plant material in which a gentle agitation of the material is preferred, by introducing the material into a process tank together with a controlled amount of processing liquid and subjecting the material to a process under *per se* known  
15 conditions, the method being characterized by the following steps,  
utilizing a double process tank which comprises an inner tank with perforated wall areas with gratings, said inner tank being rotatably supported with bearings in an outer tank with a generally vertical axis of rotation,  
choosing gratings with a mesh size such that the entire solid material is retained in the  
20 inner tank,  
controlling process parameters like temperature and pH according to the nature of the relevant process,  
agitating the process liquid by allowing the inner tank to rotate relative to the outer tank such that shovels between the inner and the outer tank facilitate a gentle agitation of the  
25 material, and  
compressing the solid material at the end of the treatment by means of a rising and lowering lid on the inner tank prior to and during the draining of the processing fluid from the tank.

Preferred embodiments of the invention and the method are disclosed by the  
30 dependent claims.

In the following description further elaboration of various features of the invention is given by way of reference to a normal operation cycle illustrated by the enclosed drawings, where

Fig. 1 shows a vertical section through an embodiment of a tank according to the invention, in which some details lying outside the plane of the section are indicated by dotted lines,

Fig. 2a is a sideview of the inner tank of the the tank shown on fig 1, showing gratings and its suporting structure.

Fig. 2b is a sideview of the inner tank of the tank shown on fig. 1, where the gratings and the supporting structure is left out to emphasize other details,

Fig. 3 depicts the lid on the inner tank from above.

Figure 1 shows a double tank 1 according to the invention with a solid wall 2 in the outer tank and a perforated wall 3 in the inner tank, and common bearings 4, 5 for both tanks about a vertical axis R-R. The outer tank has a lid 6 and the inner tank has a preferably perforated lid 7, the lid 7 being arranged so that it can be lowered in relation to the tanks around a spline shaft 15. Both the lids 6, 7 are strengthened by means of "cavelles" 30. Under the tank is shown a ball plug valve 8 through which material may be pumped into the tank for treatment, and through which the resdiue may be removed subsequent to the treatment.

Between the inner wall 3 and the outer wall 2 shovels 9 are indicated, some of which are attached to the inside of the outer wall 2, some of which are attached to the outside of the inner wall 3, so that a cooperation between these provides an agitation of the fluid in the tank when the inner tank rotates. Impellers 10 are shown at the bottom of the inner tank, the size and configuration of which will determine its contribution to a further agitation of the tank contents. For some applications it may also be appropriate to include a scraping shovel as indicated by reference numeral 11 on fig. 1. A supply conduit 12 for rinsing water is shown at the top of the tank as is a conduit 13 for the supply e.g. of nitrogen ( $N_2$ ) at the bottom of the tank. Also illustrated in Fig. 1 is a throttle valve 14 for draining of extraction fluid located upon the bottom of the tank.

Figures 2a and 2b show views of the inner tank, where several of the details from figure 1 are found, such as inner wall 3, rotation axis R-R, lid 7, shovel 9 (the ones fixed to the outside of the inner tank), impeller 10 at the supporting structure 17 of the inner tank, as well as gratings 18 at the open areas of the tank wall. A helically shaped groove 19 for guidance of the lid 7 during its lowering and raising movement is also indicated, said guidance groove 19 being arranged upon the inside of the tank wall 3. Guidance groove 19 functions as a "thread" for lid 7. At the top of the tank is a manhole which is sealed by a water- and airtight lid most of the time. Dotted lines  $L_t$  and  $L_b$  indicate the uppermost and the lowermost position of the lid 7. Figure 2b also shows castors 23 arranged to cooperate with the guide grooves 19 during lowering and raising of the lid.

Figure 3 shows the lid 7 with perforated areas 20 covered by gratings, distribution tubes 21 and rubber hoses 22 (four shown on the drawing) for washing liquid to the ejector tube 24 being supplied through the supply conduit 12 (fig. 1) through a particular device at the centre of the lid. An arrow to the left of fig. 3 indicates the rotational direction for normal operation. The drawing also illustrates the branching of the distribution tubes 21 which run along the carrier arms 25 from the axis where the distributions tubes 21 are connected to chemical resistant rubber tubes 22 or the like which in turn run from the supply tubes 21 to the ejector tube 24 along the circumference of the lid. These (rubber hoses) will not be exposed to particularly heavy wear as there will only be a downwards movement proportionally to the rotation when the lid is lowered.

The gratings 18 can be interchanged to ones with desired mesh size according to the kind of material which is treated. The agitation in the tank is effected by rotating the inner tank so that an agitation effect between the outer tank and the inner tank is obtained by means of the shovels 9, and optionally by means of impellers 10 at the bottom of the inner tank. In a preferred embodiment of the invention, the impellers 10 at the bottom of the inner tank is designed in a manner that enables them to force liquid from the centre of the tank outwards to the wall, while the shovels between the inner and the outer tank are so designed that they lift the liquid upwards in the region between the two walls. The overall effect is a generally downward movement of the liquid in the central region of the tank, and an effective, yet gentle agitation. The impellers 10 may

be inside the inner tank as shown on the drawing, or they may be outside the inner tank or partly inside, partly outside the inner tank.

To allow for a maximum movement of the liquid, it is beneficial that substantial areas of the inner tank are perforated and covered with gratings, and that the supporting  
5 structure only is sufficient to provide the tank with its necessary strength and rigidity. It is thus preferred that also the lid 7 of the inner tank is perforated and provided with gratings 18. The inner lid is arranged so that it can be lowered down into the inner tank. This is most easily done by arranging it with a central bushing 29 (fig. 2b) over a spline shaft 15 or the like, so that the lowering is simply effected by a slowing of the spline  
10 shaft 15 relative to the rotation of the inner tank, e.g. performed by means of an hydraulic braking arrangement. Outer guidance grooves 19 on the inside wall of the inner tank ensures that the lid is all the time held in a level position relative to the tank during this operation. For maximum versatility, it is beneficial to provide the lid 7 with some kind of castors 23 which roll along these guidance grooves 19 when the lid is  
15 moving up or down. The guidance grooves 19 are in a preferred embodiment designed such that the lid 7 rotates half a turn in relation to the inner tank when moving from its top position to its bottom position. The ascend angle of the guidance grooves should not exceed about 27°.

It is also preferred, as shown on figure 3, to provide an ejector tube 24 to the inside of  
20 the lid 7, said ejector tube comprising a series of nozzle openings. The purpose of this arrangement is to wash/ shower the wall of the inner tank while the lid 7 is being lowered, so that the entire residue is collected at the bottom of the inner tank, and ensuring that the downward movement of the inner tank is not hindered by remaining solid material which can stick to the gratings 18 or to the guidance grooves 19. This  
25 will also prevent solids remaining from ending up on top of the lid 7 when it is lowered. The supply of liquid is most conveniently performed through a bore in the central shaft. The rinsing liquid is normally taken from the process tank by means of a pump.

The most important objective with the feature of lowering the lid 7 is to facilitate a controlled compression of the raw material/ residue in the tank prior to the draining of  
30 the extraction liquid, so that as little as possible of the extraction liquid is held back. This further prevents the residue from acting like a filter which will hold back some of the material which is desired to be transferred with the extraction liquid. By holding the

material steady, the tank is also stabilized so that its rotational speed can be increased, which leads to an improved centrifugation of the residue.

The most practical way to attach the inner tank is at its upper end by means of carrier arms 25 which in turn are connected to the pinion shaft. The lid 7 can be attached by a so-called spline-bushing 29 to the spline shaft 15. The outer lid is strengthened with "cavells" 30 and attached water and airtight to the outer tank, preferably with bolts.

By another preferred embodiment of the invention, a scraping shovel 11 is provided in the centre of the inner tank, which preferably is mounted on a shaft 27 led through the centre of the spline shaft 15, which is designed with a central bore with dimension to accomodate said shaft 27 for the scraping shovel 11. The function of the scraping shovel is to remove material from the inlet / outlet opening 8 centrally at the bottom of the tank. There is no need for automatic controlling of the scraping shovel as it will only be operated when needed.

At the start-up of a typical process, raw material is pumped into the inner tank through the ball plug valve 8. The outlet for the extraction liquid is close to the inlet opening for the raw material, and can have the form of a throttle valve. This is pumped to a separate tank for further treatment.

The simplest way for emptying the tank of solid material, includes filling the tank with liquid and allowing the tank to rotate in a direction opposite to the rotation of normal operation, while the lid is maintained in its upper position.

It is convenient to have the possibility to supply gas to the tank. Most commonly inert gas is added to prevent oxidation of the raw material, but gases for special purposes, like additives can also be added if desired. For this purpose and according to the needs, one or more gas supplies may be provided.

Conveniently there is a drain in the lower part of the lower bearing so that the bearing can be drained before maintenance or replacement. The bearing may also be drained of any liquid during a longer stop of the tank or prior to change of extraction liquid.

Regarding the arrangement of the rotational axis R-R, it is evident that a certain deviation from a completely vertical arrangement in principle is possible, but it is inconvenient with respect to the strain thereby brought upon the tank and its bearings when the inner tank is set to rotate rapidly.



The rotational speed of the tank may vary within wide limits, but typically it will be set such that the absolute speed is in the range of 0.5 - 1 m/s at the periphery of the tank for an ordinary process. After completed processing, the residue is preferably centrifuged in order to remove as much as possible of the process liquid. During 5 centrifugation the absolute speed at the periphery will typically be within 3.5 - 6 m/s.

A process tank according to the invention will normally contain a number of per se known devices for controlling process parameters, primary temperature and liquid level. Such devices can be quite simple electrical heaters, heat exchangers and/ or pipe 10 arrangements for the addition of steam to the tank. For a typical application a steam loop 31 covering substantially the entire conical part of the bottom, with an inlet 32 arranged to the lower part of the outer tank just above the conical part. The outlet of condensate is arranged close to the bottom valve of the tank. The entire loop 32 is arranged so that it has a vertical distance of e.g. 10 cm from the conical bottom, which ensures a good contact between the steam loop and the extraction liquid. It is also 15 possible to provide a steam jacket around the entire tank in order to heat it. In order to optimize energy the extraction liquid can be circulated through an external heat exchanger where condensate from the steam loop assists in heating the extraction liquid, or the extraction liquid can be preheated in a similar arrangement when supplied to the tank.

20 The construction of the inner tank may also be additionally strengthened so that the lid 7 may conduct a further compression of the material when the lid 7 is lowered.

The size of the tank may also be varied within wide limits and is actually only restricted by the needs of the actual applications.

In the following description some practical examples of the utilization of the tank are 25 given.

#### Example 1

##### Ensilage of fish waste

Raw material consisting of fish waste from a fish processing plant is pumped into a tank 30 according to the invention while the inner tank is already set to rotate. The raw material enters through the centre 8 of the bottom of the tank into the inner, perforated tank.

Process water and blood water is separated from the raw material inside the tank and

Shells are crushed in a mill before being pumped into the tank through valve 8. When the inner tank is full, water is added and heated to desired temperature. An appropriate enzyme may also be added. Liquid additives like acids or bases are added through the supply tube 26 along the shovels 9 of the outer tank to a desired concentration. When the desired enzyme activity has taken place, the lid 7 is lowered and the resulting liquid is pumped out through the outlet 14 of the outer tank, the shells are centrifuged to remove as much as possible of the remaining liquid. The liquid can thereafter be processed further to e.g. taste substances. In the same manner as described in example 1, it is preferred to rinse the wall 3 of the inner tank while the lid is lowered.

The lid is raised to its top position and water is filled into the tank. When it is full, it is heated to desired temperature and acid is added to desired concentration. The shells are demineralised to chitin under controlled conditions wherein addition of acid is added subsequently along with the progress of the demineralisation. When the demineralisation is complete, the lid 7 is lowered with simultaneous washing of the wall 3 of the inner tank, and the tank is emptied of liquid through the outlet 14 of the outer tank. The residue material is then centrifuged. The lid is thereafter raised to its top position again and water is added for washing of the shells. The lid is again lowered and

the rinsing water is pumped out through the outlet 14 of the outer tank. When the chitin finally is pumped out, this process is handled as described by example 1, i.e. by filling the tank with water and rotating the inner tank in the reverse direction with open valve 8, draining the chitin out.

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### Example 3

Plant material for extraction of etheric oils

Relevant plants/ herbs are introduced to the tank in the form of a pumpable suspension through valve 8 or possibly through the manhole 20. Desired extraction liquid is added.

- 10 The tank is heated to desired extraction temperature. During the extraction the lid 7 may be lowered if needed or desired. After extraction is performed the lid 7 is lowered and the extraction liquid pumped out through outlet 14. The residue material is centrifuged and compressed prior to a new extraction or prior to the draining of the material through valve 8.

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### Example 4

Krill

- For this example it is convenient that the tank is placed onboard a krill trawler. When the krill is caught, the "flesh" is squeezed out in a normal manner. The krill waste is thereafter pumped into the tank through valve 8 and when the inner tank is full, the tank is filled preferably with seawater. The liquid is heated to desired temperature. An autolysis of the shells will now take place. When the autolysis is complete all the protein will be dissolved. The lid 7 is then lowered for compressing the shells under simultaneous washing of the wall 3 of the inner tank, whereafter the protein rich and oil inclusive liquid liquid be pumped out through outlet 14 possibly for subsequent treatment. The shells remaining in the tank are centrifuged to remove as much as possible of the protein rich oily liquid. Thereafter the tank is filled preferably with fresh water, the shells are washed and the procedure of pumping out repeated. When the tank has been emptied for rinsing water and the shells have been centrifuged, the tank is again filled with fresh water, acid is added to a desired concentration like in the preceding examples in order to demineralise the shells. The tank is heated to a desired temperature and acid concentration and temperature held constant during the entire
- 20
- 25
- 30

demineralisation process. When this process is completed, typically after 1 to 4 hours, the lid 7 is lowered so that it compresses the shells/ chitin and the mineral rich liquid is pumped out through the outlet 14 of the outer tank. When the tank has been emptied of liquid, the rotational direction is reversed and the lid is raised to its top position while  
5 water is filled onto the tank for washing of the chitin. The chitin is washed and compressed and the rinsing water pumped out through outlet 14. When all the (free) rinsing water has been removed, the chitin is centrifuged for remaining water.

Finally the tank is filled with water and the lid raised to its top position. The rotational direction is reversed and the chitin is pumped out thorough inlet / outlet 8 of the  
10 inner tank.

The examples above should merely be regarded as examples of how the process tank may be utilized. The scope of the invention is limited only by the following claims.

## Claims

1. Process tank for gentle treatment of its contents, particularly treatment of organic material, including means for agitation,  
5 **characterized** in that the process tank is a double tank comprising an inner tank (3) with perforated wall areas which are rotatably supported with bearings in an outer tank with a substantially vertical axis (R-R) of rotation, the perforated areas of the inner tank (3) being provided with gratings (18) and shovels (9) being arranged slantingly in the space between the inner and the outer tank, said shovels, during rotation of the inner tank,  
10 contribute to the agitation of the fluid in the tank, and a lid (7) arranged to be raised and lowered on top of the inner tank, said lid preferably is also provided with gratings.
2. Process tank according to claim 1,  
**characterized** in that the inner tank (3) is rotatably carried by an upper bearing (5) in  
15 the lid (6) of the outer tank, and that a lower bearing (4) mainly functions as a guide for the inner tank.
3. Process tank according to claim 1,  
**characterized** in that the inlet of raw material and the removal of solids takes place  
20 through a conduit which communicates with a valve (8) arranged concentrically with the lower bearing.
4. Process tank according to claim 1,  
**characterized** in that some of the shovels (9) between inner and outer wall (3, 2) are  
25 stationary shovels fixedly arranged to the inside of the outer wall (2), and others are shovels attached to the outside of the inner wall (3) and thereby rotate along with the inner tank.
5. Process tank according to claim 1,  
30 **characterized** in that the lid (7) on the inner tank is supported by a bushing (29) on a spline shaft (15) or the like, said spline shaft being arranged concentrically with the

tanks, the lid (7) being arranged to be lowerable by means of a braking mechanism on the spline shaft (15).

6. Process tank according to claim 1,  
5 **characterized** in that a nozzle tube (24) is attached along the periphery of the lid (7), said nozzle tube being intended for washing the wall (3) of the inner tank, particularly in conjunction with lowering the lid (7).

7. Process tank according to claim 1,  
10 **characterized** in that impellers (10) at the bottom of the inner tank contribute to moving extraction liquid from the centre of the tank out to the wall of the inner tank (3), and such that the liquid will pass through the gratings (18) out to the shovels (9) between the inner (3) and the outer wall (2).

15 8. Process tank according to claim 1,  
**characterized** in that the shaft (15) for the lid (7) is provided with a bore and that through this bore there is arranged the shaft of a scraping shovel (11) which can be lowered in the case of packing, to scrape away material covering the inlet/ outlet communicating with the valve (8).

20 9. Process tank according to claim 1,  
**characterized** in that guidance grooves (19) are arranged on the inside of the inner tank (3) to cooperate with grooves or castors (23) on the lid (7) to guide the movement of the lid up and down, while functioning as a "thread" for the lid.

25 10. Process tank according to claim 1,  
**characterized** in that perforated tubes (26) are arranged along the entire length of one or more of the shovels (9) on the outer tank (2) for the supply of desired chemicals.

30 11. Method for processing organic material such as fish waste, crab shells, krill or plant material in which a gentle agitation of the material is preferred, by introducing the

material into a process tank together with a controlled amount of processing liquid and  
subjecting said material to a process under *per se* known conditions,  
**characterized** by the following steps,  
utilizing a double process tank which comprises an inner tank with perforated wall areas  
5 with gratings, said inner tank being rotatably supported with bearings in an outer tank  
with a generally vertical axis of rotation,  
choosing gratings with such a mesh size such that the entire solid material is retained in  
the inner tank,  
controlling process parameters like temperature and pH according to the nature of the  
10 relevant process,  
agitating the process liquid by allowing the inner tank to rotate relative to the outer tank  
so that shovels between the inner and the outer tank facilitate a gentle agitation of the  
material, and  
compressing the solid material at the end of the treatment by means of a rising and  
15 lowering lid on the inner tank prior to and during the draining of the processing fluid  
from the tank.

12. Method according to claim 11,  
**characterized** in that the filling of material takes place at the bottom of the tank through  
20 a bottom valve and a filling tube which is located concentrically with the axis of the  
tank, while the inner tank rotates, and with its lid in a top position.

13. Method according to claim 11,  
**characterized** in that the processing liquid is an extraction liquid.  
25

14. Method according to claim 11,  
**characterized** in that the wall of the inner tank is rinsed with water during whole or part  
of the process period, through nozzles arranged at the underside of the movable lid.

30 15. Method according to claim 11,  
**characterized** in that the residue is centrifuged and or compressed after completed  
processing.

1. *Journal of the American Medical Association*, 1997; 277: 1033-1036.

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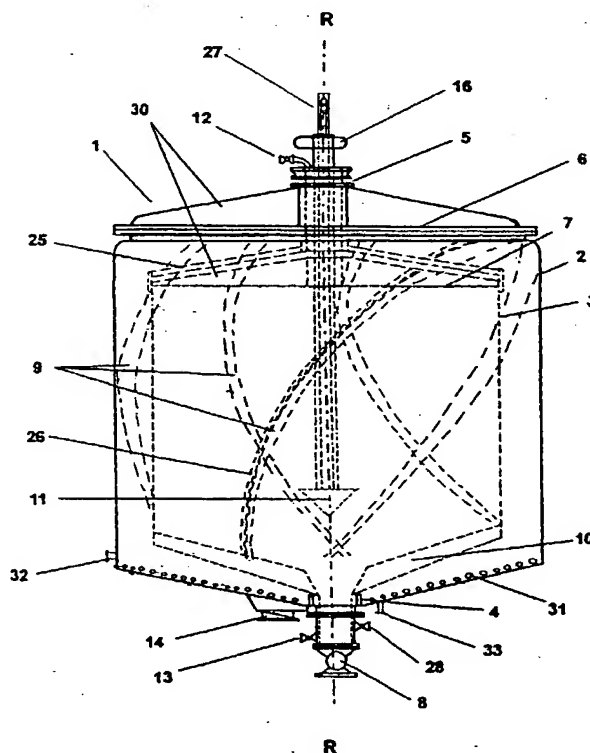
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(72) Inventors: MIKALSEN, Mikal [NO/NO]; Ytrestøyl,*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: PROCESS TANK AND METHOD FOR NON-VIGOROUS PROCESSING OF ORGANIC MATERIAL



(57) Abstract: Process tank for gentle treatment of its contents, particularly for treatment of organic material, which includes an agitation arrangement. The process tank is a double tank comprising an inner tank (3) with perforated wall areas which is rotatably supported with bearings in an outer tank with a substantially vertical axis (R-R) of rotation. The perforated areas of the inner tank (3) are provided with gratings (18) and shovels (9) are arranged slantingly in the space between the inner and the outer tank. The shovels, during rotation of the inner tank, contribute to the agitation of the fluid in the tank. Furthermore, a lid (7) is arranged to be raised and lowered on top of the inner tank. This lid is preferably also provided with gratings. The invention also concerns a method for treatment of organic material, such as fish waste, crab shells, krill or plant material, using the process tank according to the invention.

WO 00/51951 A3



Fig. 1

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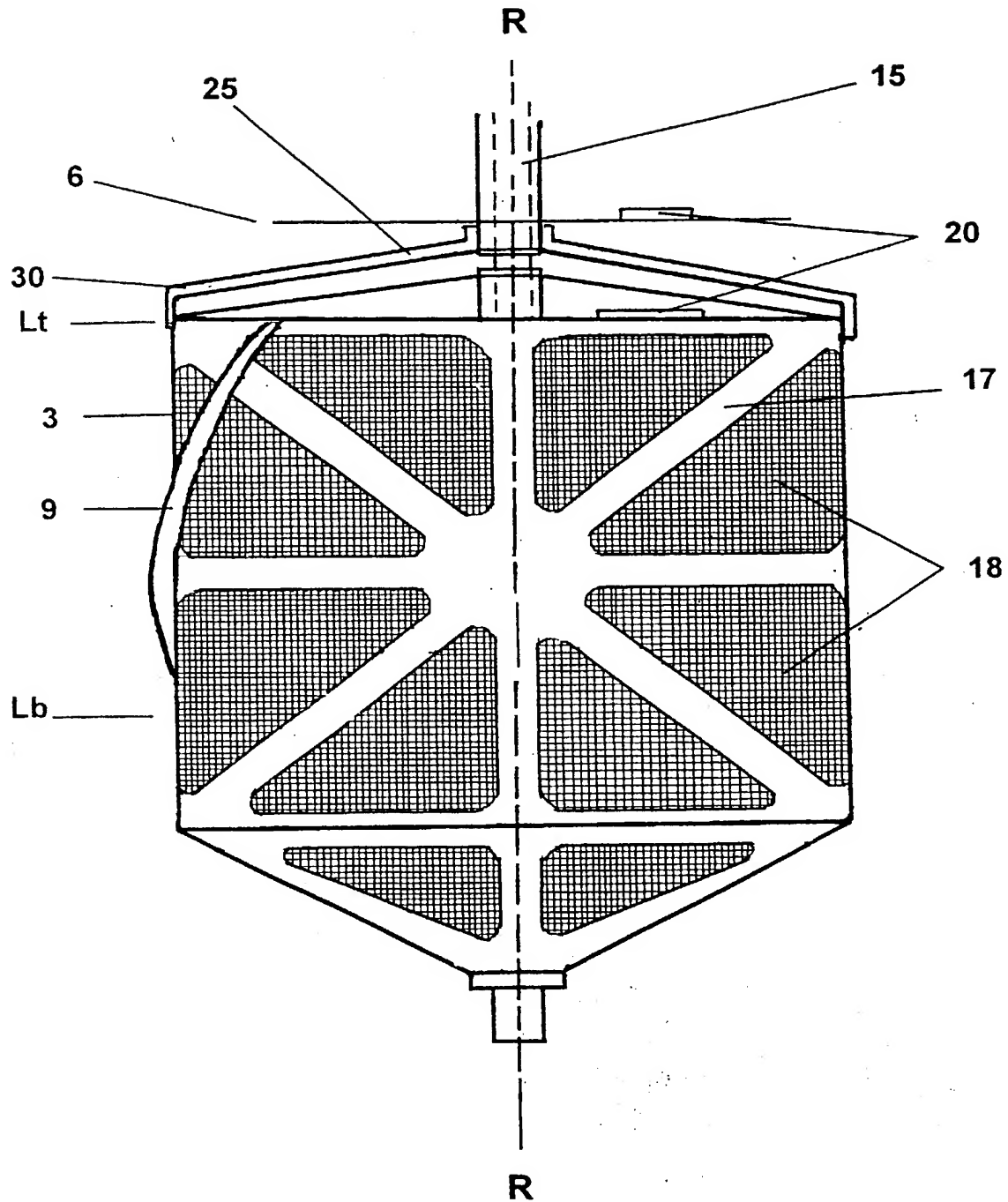


Fig. 2a

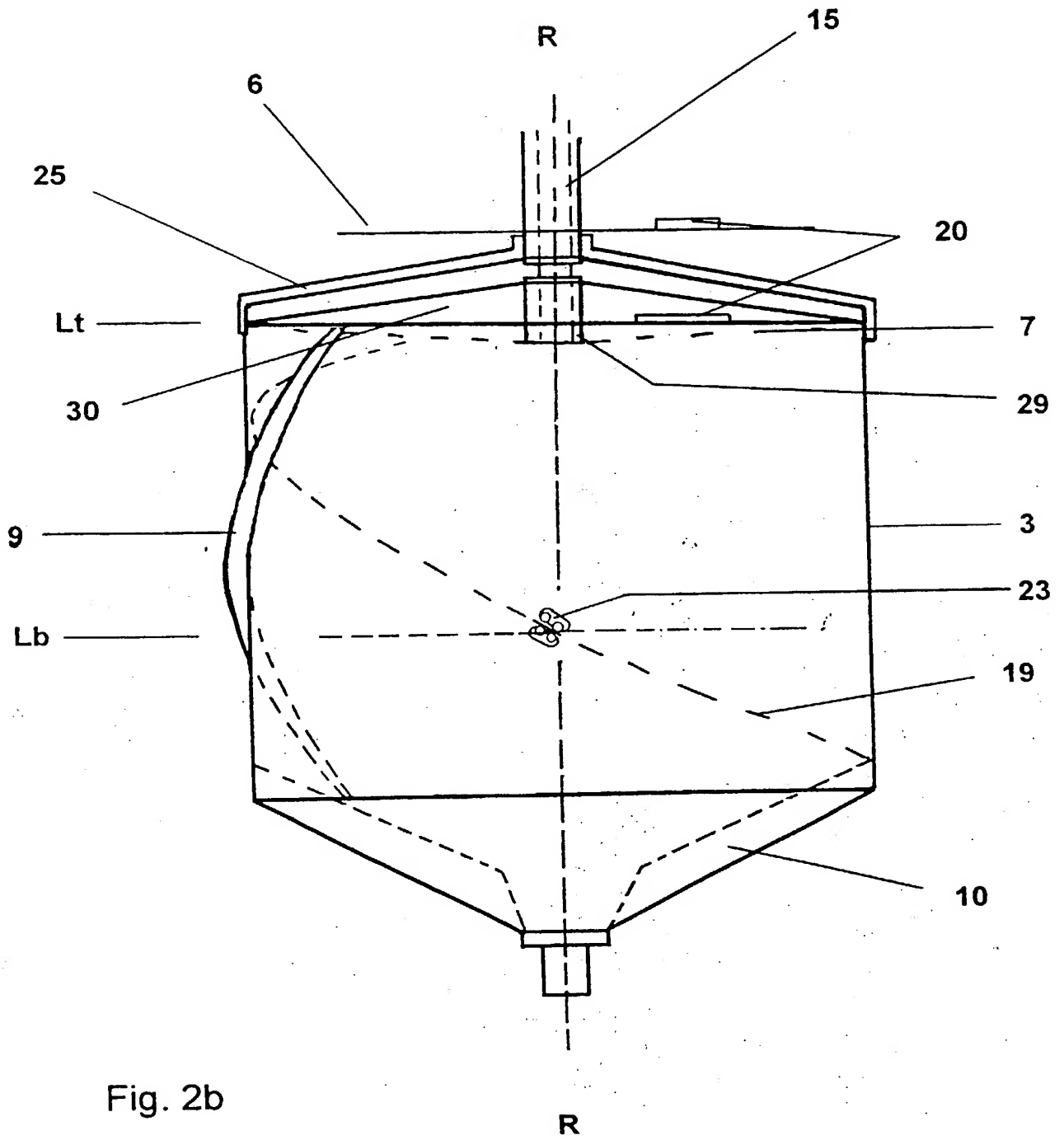


Fig. 2b

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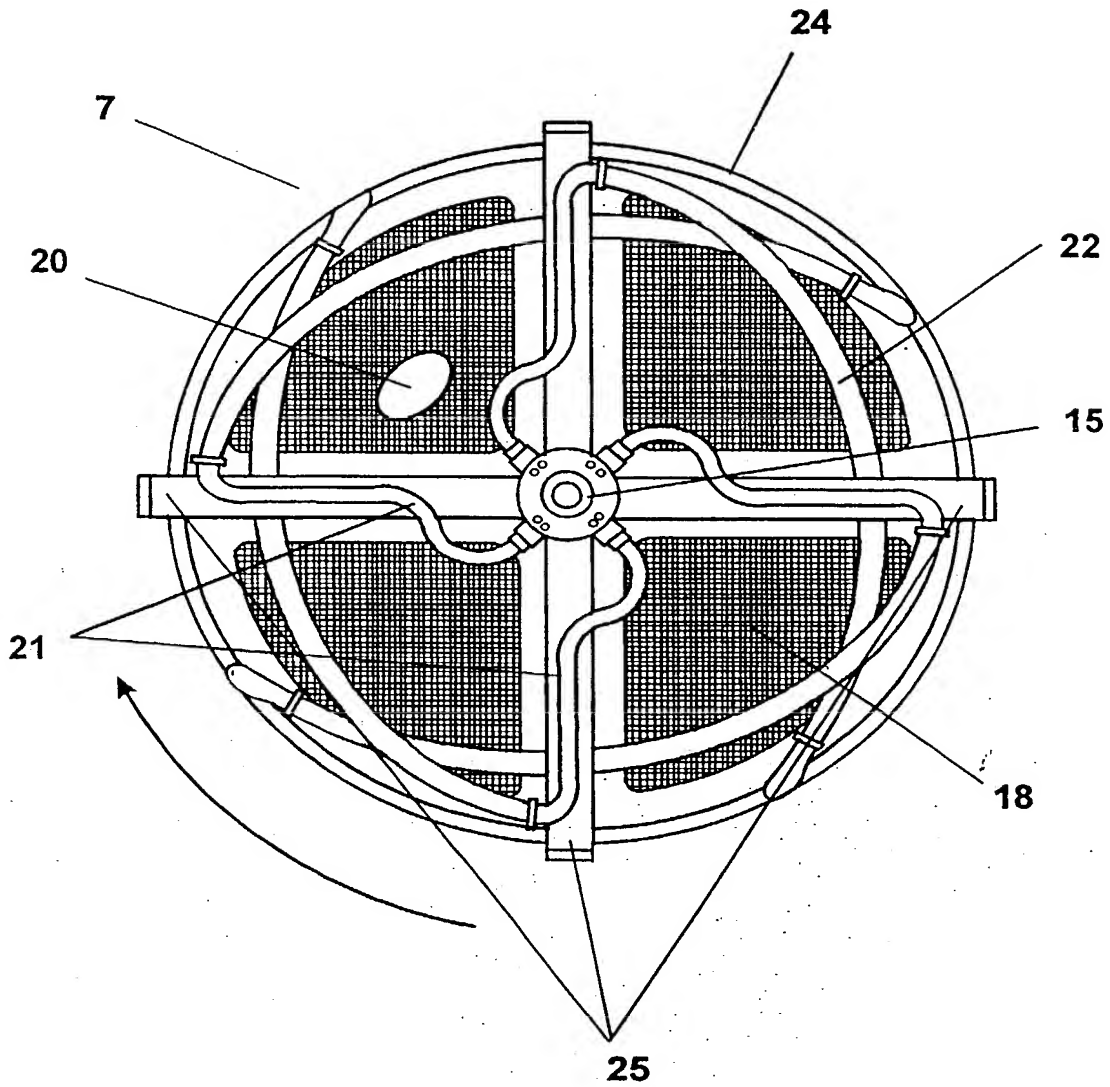


Fig. 3

## DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

Docket No. 01151

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

PROCESS TANK AND METHOD FOR NON-VIGOROUS PROCESSING OF ORGANIC MATERIAL

specification of which

(check one) XX is described and claimed in PCT International Application PCT/NO00/00062filed on (MM/DD/YYYY) February 21, 2000 amended on \_\_\_\_\_

(if applicable)

(OR) \_\_\_\_\_ is described in United States Application Number \_\_\_\_\_

filed on (MM/DD/YYYY) \_\_\_\_\_

(OR) \_\_\_\_\_ is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

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Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Claimed? Yes No
19990967	Norway	March 1, 1999	XX

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